

Response to Official Action  
Application No. 10/719,585  
Page 6

**Amendments to the Drawings:**

No amendments are made to the Drawings herein.

### **REMARKS**

By the foregoing Amendment, Claim 1 is amended and new Claims 7 and 8 are presented. Entry of the Amendment, and favorable consideration thereof is earnestly requested. Claim 6 having been previously cancelled, Claims 1-5, 7 and 8 are currently pending.

Claims 1-5 stand provisionally rejected under the judicially created doctrine of obviousness-type double patenting over claims 1, 2 and 6-16 of copending U.S. Patent Application No. 10/298,412. Claims 1-5 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Benda (U.S. Patent No. 5,472,733) in view of Prinz (U.S. Patent No. 5,207,371). Applicant respectfully asks the Examiner to reconsider these rejections in view of the above Amendments and the below Remarks.

The present invention, as claimed, is directed to a method for the production of a work piece, such as a form tool, with exact geometry and high surface quality. The work piece is constructed using a process wherein powder coatings are applied one on top of each other, by means of compaction. After the powder has been compacted, the surfaces thereof are finely machined in a mechanical manner. Claim 1 has been amended to clarify (i) that the work piece is surrounded by the powdered starting material during the mechanical finishing, and (ii) that the mechanical finishing of a first lower layer is performed after the generation of at least one upper layer on top of the lower layer, but that the mechanical finishing of the upper layer(s) is not performed at the same time as mechanical finishing the lower layer (i.e., mechanical finishing is not performed on all of the layers at once).

Thus, in a relatively simple example, a first layer is formed, a second layer is formed on top of the first layer, and then the first layer (but not the second layer) is mechanically finished while the first layer (and preferably also the second layer) is still surrounded with the powdered starting material. Subsequently, a third layer may be formed, and then the second layer (but not the third layer) may be mechanically finished while the second layer (and preferably also the first and third layers) is still surrounded with the powdered starting material. This process may be repeated until a desired thickness of the work piece is reached, at which time the last layer may be mechanically finished.

#### Double Patenting Rejection

U.S. Patent Application No. 10/298,412 (which discloses and claims an invention that was invented by the same applicants as the invention to which the present application is directed, and which has been assigned to the same assignee as has the present application) is directed to the production of a work piece by the mechanical finishing of substantially vertical lateral faces of the work piece. However, the '412 application discloses and claims that each layer be mechanically finished as it is formed or that the upper layer and lower layers be mechanically finished simultaneously. All claims, as amended, of the present application, on the other hand, require that mechanical finishing of a first lower layer is performed after the generation of at least one upper layer on top of the lower layer, but that the mechanical finishing of the upper layer(s) is not performed at the same time as mechanical finishing the lower layer (i.e., mechanical finishing is not performed on all of the layers at once).

This distinctive claimed feature of the present invention provides a significant difference over the prior art method and cannot easily be contemplated

by a person of skill in the art with the knowledge of the '412 application or other known prior art.

There are several disadvantages associated with mechanically finishing each layer one after another. The main disadvantage is that terraces or burrs will be built on the sidewalls due to the layer by layer performance. This leads to surfaces on the work piece that are not smooth and hence will cause aesthetical disadvantages when creating injection molds, which is the main target of this technology. Contrary to this, the main effect in the present invention is to wait with a mechanical finishing of one layer until at least one additional layer is formed on top of it so that the mechanical finishing of the vertical sidewalls avoids formation of terraces. Another advantage of the present invention over the prior art is the compensation of thermal changes of the work piece which goes along with precision and accuracy of the work piece dimensions. If we wait with the mechanical finishing until the layer is cooled off, no distortion will effect the dimensions of the work piece. As such, the deferred mechanical finishing method of the present invention provides a superior finishing over the immediate finishing method of prior art.

There are also several disadvantages associated with waiting until all layers are formed and then mechanically finishing them all at once. One of such disadvantages is that when the work piece is formed of numerous layers, the thickness of the work piece may make it difficult to machine all of the layers at once. Indeed, special tools may be required. Another disadvantage associated with waiting until all layers are formed and then mechanically finishing them all at once is that lower layers may have undercuts or recessed therein, such that it may be difficult to mechanically finish such recesses if a large number of layers are formed thereover.

All of the above disadvantages are obviated by the present invention, as claimed, which instead of mechanically finishing each layer as it is formed, or mechanically finishing the work piece after all layers are formed, mechanically finishes a first lower layer after the generation of at least one upper layer on top of the lower layer, but does not mechanically finish the upper layer(s) at the same time as mechanical finishing the lower layer (i.e., mechanical finishing is not performed on all of the layers at once).

#### Prior art Rejection

Benda (U.S. Patent No. 5,472,733) discloses a system and method for performing a temperature-controlled laser sintering. Benda, however, fails to disclose, teach or suggest anything whatsoever about mechanical finishing. Applicant notes that the Examiner expressly recognizes such in the outstanding Office Action dated April 4, 2006 ("Benda is silent to the mechanical finishing aspects sought in the claims.").

Prinz (U.S. Patent No. 5,207,371), on the other hand, discloses an apparatus and method for forming a three-dimensional object, with successive layers of metal welded together to build the object. Prinz further discloses a mechanical finishing process performed by milling of the welded layers to a final shape. However, Prinz discloses that the layers are mechanically finished "*either after each layer is formed or after all layers have been made.*" Thus, with respect to the timing for mechanical finishing, Prinz teachings are essentially identical to the teachings of the '412 application discussed above. Specifically, Prinz does not disclose, teach or suggest in any way that mechanical finishing of a first lower

layer is performed after the generation of at least one upper layer on top of the lower layer, but that the mechanical finishing of the upper layer(s) is not performed at the same time as mechanical finishing the lower layer (i.e., mechanical finishing is not performed on all of the layers at once).

In addition, Applicant respectfully submits that neither Benda nor Prinz discloses, teaches or suggests in any way that each layer be mechanically finished while the layer is still surrounded with powdered starting material. The Examiner states that it would be inherent for the work piece of Benda to be surrounded during production. However, all claims, as amended, now require that the layers be surrounded with powdered starting material as they are mechanically finished. Clearly, such can not be disclosed by Benda, since Benda is silent as to mechanical finishing. Prinz also clearly does not disclose, teach or suggest this limitation, since it is clearly described in the text, and shown in the Figures, of Prinz that there is no powdered starting material surrounding any layer as it is being mechanically finished.

Furthermore, Applicant respectfully submits that it would not have been obvious to have modified the Benda and Prinz combination to arrive at this aspect of the claimed invention. It is well settled that the mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination or modification. *In re Mills*, 916 F.2d 680, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990). Here, there is absolutely no suggestion in either reference to perform mechanical finishing on a layer while that layer is surrounded with powdered starting material.

Moreover, Applicant respectfully submits that such a modification is contrary to the conventional wisdom of those skilled in the art. It is generally

understood that it is undesirable to mechanically finish a compacted layer while the layer is still surrounded with powdered starting material, since the traditional tools for mechanical finishing generally cause substantial disturbances in the powdered starting material, which makes it more difficult to form subsequent layers. However, Applicant has invented a mechanical finishing tool having a configuration which allows it to produce acceptable results, while at the same time being very small in diameter (typically having a diameter of about 0.5 mm). Using such a tool, Applicant has, contrary to conventional wisdom, discovered that mechanical finishing can be performed by dipping the tool into the powdered starting material surrounding the work piece without any disturbances in the powdered starting material. As such, the present invention can provide a finishing process more efficient and productive than the prior art method for finishing the multiple layers of the work piece. Applicant has also surprisingly discovered that the inventive method is capable of producing a better finish than previously known methods, because the abrasiveness of the powdered starting material surrounding the layers during mechanical finishing actually may enhance such finishing.

For the foregoing reasons, Applicant respectfully submits that all pending claims, namely Claims 1-5, 7 and 8, are patentable over the references of record, and earnestly solicits allowance of the same.

Respectfully submitted,



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